Dr. Hare also made some remarks on the aurora which occurred on the third of September, in which he suggested that the electric fluid, producing the phenomena then observed, might have been derived from remote parts of space.

Stated Meeting, October 18.

Present, thirty-one members.

Mr. Du Ponceau, President, in the Chair.

The following donations were received:—

FOR THE LIBRARY.

Nova Acta Regiæ Societatis Scientiarum Upsaliensis. Vol. X. Upsala, 1832.—*From the Society.*

Mémoires publiés par la Société Royale et Centrale d'Agriculture. Année, 1838. Paris, 1838.—*From Mr. D. B. Warden.*

Extraits des Procès-Verbaux de la Société Philomathique de Paris, 1836, 1837, 1838.—*From the same.*

Académie Royale des Sciences de Turin. Classe des Sciences Physique et Mathématiques. Question de Physique, pour l'année 1841. Turin, 1839.—*From the Academy.*

Triennial Catalogue of the Theological Seminary, Andover, Massachusetts. Andover, 1839.—*From the Rev. Oliver A. Taylor.*

Report on the Magnetic Isoclinal and Isodynamic Lines in the British Islands. By Major Edward Sabine, R. A. F. R. S. London, 1839.—*From the Author.*

Allgemeines Bibligraphisches Lexikon. Von Friedrich Adolf Ebert. Leipsic, 1821.—*From Mr. John Penington.*

are represented as competent to perform a most important part in the production of electrical storms; nor did he feel at liberty to make any remarks in support of an opinion which he had recently formed, that a hurricane is a gigantic tornado. Neither had he time to cite the evidence furnished by Reid's work upon storms, in favour of a local force or gyration, like that of which he had seen proofs, arising from the New Haven tornado.

A System of Anatomy for the Use of Students of Medicine. By Caspar Wistar, M. D. With Notes and Additions by William E. Horner, M. D. Seventh Edition. By J. Pancoast, M. D. Two Vols. Philadelphia, 1839.—*From the Editor.*

A Sketch of Chinese History, Ancient and Modern. By the Rev. Charles Gutzlaff. Two Vols. New York, 1834.—*From Mr. John Vaughan.*

Catalogue of the Library of the Theological Seminary in Andover, Massachusetts. By Oliver A. Taylor, M. A. Andover, 1838.—*From the Trustees of the Seminary.*

Rapport sur les travaux dans la vue de déterminer la marche du temps dans les principales localités du Royaume de Belgique, par A. Quetelet, Directeur de l'Observatoire de Bruxelles. Brussels, 1839.—*From the Author.*

Synopsis Reptilium Sardiniæ Indigenorum. Auctore Josepho Géné. Turin, 1839.—*From the Author.*

Osservazioni Mineralogiche e Geologiche per servire alla Formazione della Carta Geologica del Piemonte di Angelo Sismonda. Turin, 1839—*From Prof. A. D. Bache.*

Historical Account of Massachusetts Currency. By Joseph B. Felt. Boston, 1839.—*From Mr. T. L. Winthrop.*

Institut Royal de France. Funérailles de M. Langlois. Discours de M. Le Bas. Paris, 1839.—*From Mr. D. B. Warden.*

Institut Royal de France. Académie Française. Translation des Restes de la Harpe. Discours de M. Tissot. Paris, 1839.—*From the same.*

L'Echo du Monde Savant. Nos. 450 and 451. Paris, 1839.—*From the same.*

Description d'un Colorimètre a Double Lunette, par M. Collardeau. Paris, 1839.—*From the same.*

Discours de M. le Baron Thénard, a l'occasion des récompenses décernées le 28 Juillet, 1839. Paris, 1839.—*From the same.*

Description d'un nouveau Procédé pour prévenir les Explosions des Chaudières à Vapeur. Par M. Félix Passot. Paris.—*From the same.*

Filtrations Publiques. Réponse aux Détracteurs du Système Fonvielle. Paris, 1839.—*From the same.*

Notice sur les Embaumements, procédés de M. Gannal. Paris.—*From the same.*

Ostéographie ou Description Iconographique Comparée du Squelette et

du Système Dentaire des cinq Classes d'Animaux vertébrés récents et fossiles. Par M. H. M. Ducrotay de Blainville. (Prospectus.) Paris, 1839.—*From the same.*

Note sur l'Origine de nos Chiffres et sur l'Abacus des Pythagoriciens. Par. A. J. H. Vincent. Paris.—*From the same.*

Compte Rendu des travaux de la Société Royale et Centrale d'Agriculture. Année 1837–38. Par M. Soulange Bodin. Paris, 1838. *From the same.*

Histoire de l'Introduction et de la Propagation des Mérinos en France; ouvrage posthume de M. Tessier. Paris, 1839.—*From the same.*

Question des Sucres. Nouvelles Considérations. Par C. J. A. Mathieu de Dombasle. Paris, 1838.—*From the same.*

Société Royale et centrale d'Agriculture. Rapport sur le Concours pour les Ouvrages, Mémoires et Observations de Médecine Vétérinaire pratiques. M. Girard, rapporteur. Paris.—*From the same.*

Pamphlets relating to Agriculture and on Miscellaneous Subjects, (in French and English.) Paris.—*From the same.*

The National Portrait Gallery of Distinguished Americans. Part XLII. Biography of Charles Cotesworth Pinckney. Philadelphia, 1839.—*From the Author.*

Third Specimen of a New Method of Printing Music for the Blind, invented by M. Snider. Philadelphia, 1839.—*From the Inventor.*

Legenda Svecana Vetusta S. Magni Comitis Orcadensium. Upsala. *From President John Henry Schröder.*

Numi Ducum Reipublicae Venetae in Numophylacio Academico Upsaliensi. Upsala.—*From the same.*

Mahmud Schebisteri's Rosenflor des Geheimnisses. Persisch und Deutsch. Von Hammer-Purgstall. Pest, 1838.—*From the Author.*

Hindustani Atlas.—*From the Rev. J. P. Engles.*

Biblical Apparatus, in four Parts: Designed to Assist in the Correction of Present, and the Preparation of Future Versions of the Sacred Scriptures. By the Rev. W. Yates. (Prospectus.) Calcutta, 1837.—*From the same.*

Jahrbücher der Literatur. Nos. 81 to 84, inclusive. Vienna, 1838.—*From Baron Von Hammer-Purgstall.*

Chinese Magazine. Edited by the Rev. Charles Gutzlaff. (Chinese.) Nos. 6 to 9, inclusive.—*From the Editor.*

The American Medical Library and Intelligencer. By Robley Dunglison, M.D. Nos. 11 to 14 Philadelphia, 1839.—*From the Editor.*

Specimen of the Transfer Process invented by Joseph Dixon of Taunton, Massachusetts. Boston, 1839.—*From the Author.*

Mr. S. C. Walker, in behalf of the Committee on the paper entitled, "Astronomical Observations made at Hudson Observatory, &c. by Elias Loomis, Professor of Nat. Philos., &c. in the Western Reserve College, Hudson, Ohio," made the following report:—

The memoir of Prof. Loomis contains a description of the Hudson Observatory, erected at the expense of the Western Reserve College, at Hudson, Ohio. The building consists of a central portion, fifteen feet square upon the inside. From a circular platform of ten feet diameter, rise twelve small cherry columns, that sustain a hemispheric dome of nine feet internal diameter, covering a five and a half feet equatorial of 3.8 inches aperture, by Simms. The dome rotates on ten lignumvitæ wheels of five inches diameter. The equatorial rests on an insulated pier, descending six feet below the surface of the ground, and rising three feet above the platform, which is, itself, about six feet above the surface of the ground.

The eastern wing is ten feet by twelve, and seven and a half feet high, and covers a Simms' transit circle of eighteen inches diameter, graduated on platinum to 5′, and reading to single seconds by three Troughton's microscopes. The telescope has a focal length of thirty inches and an aperture of 2.7 inches. The transit circle, and a clock by Molyneux are each mounted on separate insulated piers. The western wing contains no instruments; but serves for a lodging-room, computing-room, &c.

Prof. Loomis gives the following results for the latitude of the Hudson Observatory.

By u. c. Polaris,	Aug. 8,	Latitude	41°	14′	39.″8
	„ 10,				36.7
	„ 13,				36.8
	„ 14,				37.8
	„ 15,				40.8
	„ 17,				36.6
		mean	41	14	38.1

By u. c. δ ursæ minoris, Aug. 13, Latitude	41°	14′	35.″1
„ 17,			36.2
mean	41	14	35.7

From which he concludes that the latitude is 41° 14′ 37.″ nearly.

The paper contains a series of fifty moon culminations, one eclipse, and six occultations, observed in 1838 and 1839. These furnish data for determining the longitude of the Hudson Observatory when corresponding European and American observations shall have been obtained. Prof. Loomis gives for the approximate longitude $5h\ 25m\ 42s$. It may be proper to add, that one of the undersigned, S. C. Walker, having reduced the six occultations contained in this paper, and compared them with four corresponding observations at the Philadelphia Observatory, four at the Dorchester Observatory, two at Mr. Paine's House, Boston, and one at Princeton College, New Jersey, finds for the longitude of the Hudson Observatory, $5h\ 25m\ 47s$.

The instruments for this observatory were selected by Professor Loomis during his late journey in Europe. This economical establishment appears to be more complete than any of the kind now known to be in operation in the United States, and the Committee cordially recommend the example of the Western Reserve College, as worthy of being followed by those Universities which are desirous, at moderate expense, of inculcating practical astronomy, of making observations highly useful for geographical purposes, and of prosecuting interesting researches connected with the progress and advancement of astronomy.

The Committee recommend the paper for publication.

SEARS C. WALKER,
R. M. PATTERSON,
GEO. M. JUSTICE,
Committee.

The recommendation in favour of publication, was adopted.

Dr. Bache, on behalf of the Committee on Dr. Hare's paper, entitled "On the extrication of Barium, Strontium and Calcium," reported in favour of publication in the Society's Transactions, which was ordered accordingly.

In this paper Dr. Hare first calls attention to the following phenomenon observed by him almost twelve years since, and published.

When the circuit in a galvanic battery, the deflagrator of the author, was completed through a saturated solution of chloride of calcium, the anode being formed by a coarse, and the cathode by a fine platinum wire, the latter was rapidly fused, while, when the situation of the wires was reversed, the ignition was comparatively feeble. It having occurred, some months since, to Dr. Hare, that this phenomenon might be due to the evolution and combustion of calcium at the cathode, he proceeded to apply a galvanic deflagrator of three hundred and fifty pairs of plates, in the process of Berzelius and Pontin, for preparing the amalgams of the metallic radicals of the earths. The author gives a sketch of the present state of our knowledge in relation to the metallic bases of the alkaline earths, as derived from the experiments of Davy; adding his own observations, in confirmation of the declaration of Davy, that the substances obtained by him from baryta and strontia, were amalgams of their metallic bases, and not the bases themselves; and, further, that the process employed for obtaining calcium, by Davy, was really incompetent to effect the desired result. He then proceeds to describe the peculiar apparatus by which amalgams of barium, strontium and calcium were procured; the chlorides of the respective alkaline radicals being exposed to galvanic action, the cathode being mercury, and the anode a coil of platinum wire. The details of the apparatus cannot be properly understood without the figure which accompanies Dr. Hare's communication: its chief peculiarities are the following: 1st. It furnishes the means of keeping the mercury, forming the cathode, at a temperature nearly as low as 32° Fah. 2d. It prevents exposure of the amalgam of the radical, to the direct action of the chlorine from the chloride used. 3d. The alternate and successive, or the simultaneous action of two galvanic deflagrators, was conveniently obtained.

Dr. Hare states, that after operating with a series of two hundred pairs of plates of one hundred square inches each, for twenty minutes, unaided by these improvements, he had found the proportion of calcium to be but one six-hundredth part of the amalgamated mass.

An apparatus for distilling the amalgam is also described and figured in Dr. Hare's memoir. It consists of an iron alembic, connected with a glass receiver, and an adopter communicating with a reservoir of hydrogen, and containing chloride of calcium and quicklime. Within the alembic, an iron crucible, containing the amalgam, was placed, the crucible being closed by a capsule, in which was a portion of caoutchoucine, and by its cover. Naphtha was poured into

the alembic. The air from the apparatus was expelled by hydrogen, desiccated by passing through the chloride of calcium and quick-lime in the adopter. The distillation was conducted by applying heat principally to the upper part of the amalgam, to prevent an explosive ebullition. The mercury being distilled off, which requires a bright red heat in expelling the last portions, the metallic radical remained in the crucible.

The metals oxidize rapidly in water; are brittle, fixed, and require a good red heat for fusion. They sink in sulphuric acid. By keeping in naphtha, they acquire a coating which renders them less active when exposed to water.

Dr. Hare attempted to separate the mercury from the amalgams when solidified by the use of solid carbonic acid, by straining them through leather, but the result did not answer his expectations.

By using solid carbonic acid and hydric (sulphuric) ether, Dr. Hare solidified a mass of the amalgam of ammonium. He considers that in this case a portion of ether combines with the alloy, without impairing its metallic character.

Professor Bache, Reporter, informed the Society, that No. 7 of the Society's Proceedings, was now printed.

Professor Bache, in behalf of Professor Alexander, of Princeton, made a verbal communication of a description of the aurora borealis, of September 3d, 1839, as it appeared at Princeton.

At about ten or fifteen minutes past eight, P. M. an ill-defined, but considerably bright light was seen to extend for some distance above the horizon, in a direction nearly due east; it was similar, in intensity and appearance, to a lunar twilight. Soon after this, a continuous arch or zone of light was manifest, extending from the same spot to the opposite, or nearly opposite portion of the western horizon. This soon separated into two parts,* and, after a short interval, beams of light shot up from the eastern portion of the arch, which were speedily multiplied in every direction around the observer, except within about thirty degrees of the *true* (or, it might be, *magnetic*) south.

A corona was soon formed, which was at first quite indistinct, and was not continuous for any great length of time, during the existence

* Two arches, it is believed, were at this time formed, and either separated throughout their entire extent, or united only near their extremities; but this my notes do not explicitly state.

of the aurora, except at the period of its greatest brilliancy. At about twenty minutes past eight, this corona was situated in a line with, and about midway between α Aquilæ and α Lyræ. This may be considered as a very tolerable approximation to its position, though, from the apparent intersection, or, as it might almost be termed, interweaving of the beams which composed it, it was not often easy to fix upon the place of its centre with much precision, if indeed that which seemed its centre, did not really change its place; since, at times, it seemed to occupy a position very sensibly lower than that which the preceding observation would indicate.

At about half past eight, the appearance of the aurora was superb. The radiations which extended from the corona, nearly reached the horizon in every direction, with the exception of those which tended toward the southern space beforementioned, which, it is believed, was even at this time bounded by something like an arch, that was convex toward the zenith. The aurora was often party-coloured; frequently of a rose-red, especially in spots, in that portion of the sky which might be supposed to be near the plane of the dipping needle; and also about the centre of the corona. It was in the part of the heavens here described, that the arch of greatest intensity could most commonly, if not uniformly, be traced: though the crown of it frequently faded away, or became excessively faint.

Between the spots, of red light, or beams of the same tint, others were observed, which, either from the effect of the first mentioned colour, or something peculiar to themselves, appeared of a colour approaching to a bottle-green.

At times, again, when the corona was deficient, the appearance of what remained on each side of the vacant spot, was not unlike that of two immense comets; their heads some small distance asunder, and their tails turned eastward and westward.

The light of the corona, when most perfect, was quite dense, not only at the central point, but also near to what seemed to be the outer limits of its radiations, at which the tint commonly exhibited the nearest approach to white.

Two meteors or shooting stars were seen, which in both cases *appeared* to pass *between* the aurora and the eye of the observer; one nearly in the direction of the arch of greatest intensity, and the other almost perpendicular to it. The precise times of their appearance were not noted, though they fell within that period in which the phenomena already described were exhibited.

The corona formed again at nine; and, though again broken, was imperfectly visible after that time.

At half past nine, the eastern portion of the sky became tinted with intense red and green; but at half past ten, little else remained than the appearance of bright horizontal beams of a white colour in the north.

If it be admitted that the centre of the aurora was precisely midway between α Aquilæ and α Lyræ, at twenty minutes past eight, its azimuth must have been 1° 14′ 42″ E. of S., and its altitude 73° 27′ 6″; the latitude of the observer being 40° 20′ 47″ N. The point thus designated, would be very nearly in the direction of the dipping needle; the dip being, by observation, 72° 47′ 6″ (72° 47.1′) and the variation (though not accurately determined,) some 4° W. or that of the S. end of the needle, of course, the same extent to the east. The degrees of azimuth, reckoned on a parallel to the horizon at an altitude of 72° and more, being small, the deviation from the direction of the dipping needle, measured on the arc of a great circle, would be scarcely more than 1° towards the N. W.

Professor Bache stated that his own observations near Philadelphia, of the altitude of the apparent converging point of the auroral beams, at nine P. M. made it but about 69°. He had witnessed a case of the appearance of a dark spot of irregular shape, between two beams of light, which was certainly not a cloud, as the stars were not at all obscured by it, and which he supposed to be the phenomenon referred to recently by Professor Lloyd. No mottled clouds, such as usually attend the aurora, were visible during the period between nine and ten o'clock, when he had been able to observe. Professor Bache stated that he did not place much stress upon his measurements, as he had been prevented from sustained observation by indisposition. There had been, in the newspapers, an account of an auroral display visible at London, on the morning of the fourth of September, at about the same absolute time as at Princeton, according to Professor Alexander's observations. It was said to have been accompanied by a very unusual number of shooting stars, compared in one statement to the splendid display of November 13th, 1833.

Professor Henry had examined the light of this aurora by the polariscopes of Savart and Arago, but had not been able to detect the slightest trace of polarization.

The following extract from a letter, addressed by Professor Henry, of Princeton, to Professor Bache, was read, announc-

ing the discovery of two distinct kinds of dynamic induction, by a galvanic current.

"Since the publication of my last paper, I have received through the kindness of Dr. Faraday, a copy of his fourteenth series of experimental researches; and in this I was surprised to find a statement directly in opposition to one of the principal results given in my paper. It is stated in substance, in the 59th paragraph of my last communication to the American Philosophical Society, that when a plate of metal is interposed between a galvanic current and a conductor, the secondary shock is neutralized. Dr. Faraday finds, on the contrary, under apparently the same circumstances, that no effect is produced by the interposition of the metal. As the fact mentioned forms a very important part of my paper, and is connected with nearly all the phenomena described subsequently to it, I was anxious to investigate the cause of the discrepancy between the results obtained by Dr. Faraday and those found by myself. My experiments were on such a scale, and the results so decided, that there could be no room for doubt as to their character; a secondary current of such intensity as to paralize the arms having been so neutralized, by the interposition of a plate and riband of metal, as not to be perceptible through the tongue. I was led by a little reflection to conclude that there might exist a case of induction similar to that of magnetism, in which no neutralization would take place; and I thought it possible that Dr. Faraday's results might have been derived from this. I have now, however, found a solution to the difficulty in the remarkable fact, that an electrical current from a galvanic battery exerts *two* distinct kinds of dynamic induction: one of these produces, by means of a helix of long wire, intense secondary shocks at the moment of breaking the contact, and feeble shocks at the moment of making the contact. This kind of induction is capable, also, of being neutralized by the interposition of a plate of metal between the two conductors. The other kind of induction is produced at the same time from the same arrangement, and does not give shocks, but affects the needle of the galvanometer; it is of equal energy at the moment of making contact, and of breaking contact, and is not affected by the introduction of a plate of copper or zinc between the conductors.* The phenomena produced by the first

* Since writing the account of the two kinds of induction, I have found that the second kind, although not screened by a plate of copper or zinc, is affected by the introduction of a plate of iron. In the cases of the first kind of induction, iron acts as any other metal.

kind of induction form the subject of my last paper as well as that of the one before; while it would appear from the arrangement of Dr. Faraday's experiments, that the results detailed in his first series, and those in the fourteenth, were principally produced by the second kind of induction. Although I may be too sanguine in reference to the results of this discovery, yet I cannot refrain from adding that it appears to lead to a separation of the electrical induction of a galvanic current from the magnetical, and that it is a step of some importance towards a more precise knowledge of the phenomena of magneto-electricity."

Dr. Bache announced the death of William Sullivan, Esq., late a member of the Society, and Dr. Hare was requested to prepare an obituary notice of the deceased.

The following gentlemen were duly elected members of the Society:—

Thomas U. Walter, of Philadelphia.
John Penington, of Philadelphia.
Eugene A. Vail, of Paris.
Charles Rümker, of Hamburgh.
Charles Gutzlaff, of Macao.
John Washington, Captain R. B. N.
Elias Loomis, of the Western Reserve College, Ohio.
Stephen Alexander, of Princeton College, N. J.